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Socio-economic Status, Patterns of Care, and Survival Times in a Supportive Oncology Cohort

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Abstract Cover Page

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Abstract

Socio-economic Status, Patterns of Care, and Survival Times in a Supportive Oncology Cohort

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Karen Andrea Armstrong

Research suggests that disparities in all-cause cancer survival times include a dynamic interplay of Socio-economic status (SES) and patterns of care. The purpose of this study was to examine survival times and patterns or care among SES strata within a supportive oncology cohort at a large academic medical center.
After obtaining IRB approval, a retrospective chart review of medical records from 2013-2017 was conducted. The sample (n=4495) of adult cancer patients was 50% female, 51% white, and mostly (81%) high SES position. The mean age was 66.24 years (SD=15.23). Treatment patterns included 596 (14%) chemotherapy, 402 (9%) radiation, 415 (9%) both chemotherapy and radiation; and 3015 (68%) reported not having any treatment. Median survival time was 12.88 days. Over 95% of sample reported multiple comorbidities while 76% reported enrollment in government insurance. Based on the conventional result, high SES patients were more likely to have treatment compared to the low SES patients (OR= 1.64; confidence interval 1.24, 1.99). We conducted a bias analysis to address potential threats to validity of the study. Conditional on the accuracy of the bias-adjusted model, high SES patients were 4.54 times more likely to receive treatment compared to low SES patients. After controlling for age, sex, race, co-morbidities, SES, and insurance status, hazard of mortality between those with no cancer treatment was HR=1.03 (0.96, 1.11) times the corresponding hazard among those receiving treatment. Our findings, taken in context with those of previous studies, suggest that patients with higher SES are more likely to receive chemotherapy and/or radiation compared to their low SES counterparts although we did not observe real differences in survival times between treatment groups. We need further investigation to examine the effect of SES, in combination with other psychosocial variables, to obtain valid estimates of the association between SES and survival times.

Cover Page

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To God be the glory, great things He has done!

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Chapter 1
Background/Literature Review

Prevalence of Cancer

Cancer is the second leading cause of death (22.5%) in the United States. Surveillance Epidemiology and End Results (SEER) data from the National Cancer Institute estimate 1,688,780 new cases of cancers of any site and an estimated 600,920 deaths this year [1]. While cancer incidences are higher for men than women among all racial ethnic groups, increasing new cases persist among African-American men. Researchers posit that cancer prognosis, treatment, and outcome are complex and intertwined [2]. Further, relationships intersect with psychosocial exposures such as socio-economic position [3].

Traditionally, research examining major determinants of premature and preventable mortality focused on health behavior or lifestyle factors [4]. However, in recent studies, researchers noted differences in health outcomes based on socioeconomic gradients as a prevailing and even more persuasive public health problem [5]. For example, researchers looked at the challenge of the gradient in socioeconomic status in health research [6]. They argued that researchers usually control for SES rather than examine it [7].

Voluminous research shows a graded association with health at all levels of SES; this observation requires new thought about the means through which SES exerts effects [8]. Research suggests that individuals with a higher SES typically enjoy better health compared to those with low SES [6]. Moreover, education is crucial for positive health outcomes and self-management for people with chronic illness. Lack of knowledge and

awareness of cancer may be attributable to disproportionately higher risks in low-income populations [9]. Researchers posited that the degree to which behavioral risk factors explain the observed association between socioeconomic status and all-cause mortality warrants further investigation.

For example, researchers used a longitudinal survey study design to examine the impact of education and income and health behaviors on the risk of dying within 7 1/2 years. They used a nationally representative cohort of 3617 participants in the study [7]. The main outcome measure was all-cause mortality verified through the national death index and death certificate reviews. The results provided evidence that education and income partly explained differences in mortality after controlling for age, sex, race, residence, and education. The hazard ratio (HR) of mortality was 3.22 (confidence interval 2.01 to 5.16) for people with low economic status and HR= 2.3 (confidence interval 1.49 to 3.67) for those in the high SES group. In fact, even after health risk factors were considered, the risk of dying was still higher for the lowest income group (HR=2.77) compared to the high income group [9].

Socio-economic position (SEP) is a significant predictor of health. Research suggests that marked differences in disease burden, morbidity, and mortality persist across race and along socioeconomic gradients [10-12]. It is well established that population health is often affected by differential exposure to social determinants and patterns of care. For example, researchers looked at socioeconomic factors, health behaviors, and mortality using results from a national representative prospective study of US adults. They found that lower SES whites and blacks report significant disparities in health and well-being compared to white peers with higher SES [7]. Moreover, despite the strong associations

between health outcomes and health behaviors, these differences only account for a small proportion of social inequality in overall mortality, since lifestyle choices do not explain much of the relationship between SES and mortality [13]. Consequently, it is difficult to study each variable in isolation [6, 14-17].

In a recent study, researchers provided evidence that a significant portion of the sample was socioeconomically disadvantaged [7]. For example, 25% reported <12 years of education, 19% reported annual incomes of less than $10,000 and 9% of the sample died during the 7.5 years follow up period. Persons with low education were more likely to die than those with >=16 years of education. This finding is important given that low education is a proxy for low SES in many studies. Researchers noted that persons with low SES were more than three times as likely to die during the follow up compared to those in the highest group. Further, low income is more predictive than education of mortality. Research suggests that persons with low SES experience multiple stressors at the individual and institutional level [7, 9].

Researchers postulated that the dynamic interplay of socioecological and behavioral factors promote negative health outcomes. Additionally, research shows that communities segregated by race or ethnicity experience large differences in social economic status that widen the health disparities chasm. Further, public health implications arise based on one's residence and the context in which races reside; significant racial differences in residential environment persist [6, 14-17].

Research suggests that access alone could not explain the SES gradient, so we need more emphasis on psychological and behavioral variables [18]. Researchers overlook them and focus on material aspects of SES behaviors. Researchers provide

evidence that higher SES reduces stress and its somatic correlates; it diminishes the likelihood that people will encounter negative events [19]. However, lower income respondents experience more stressful life events beyond their control compared to their higher SES counterparts. In several longitudinal studies, important SES indicators, including income and education, were inversely proportional to mortality outcomes including premature mortality and death from all causes [6, 14-17]. Moreover, empiric data show that people with low SES are more likely to lead negative lifestyles and display behaviors that promote negative health outcomes [6, 20].

Supportive Oncology

It is well established that an embedded supportive care clinic within an oncology practice may facilitate better access to experienced oncologists [21]. Further, oncology practices improve patient access to symptom related care to avoid unnecessary admissions, so an embedded supportive oncology clinic may accomplish these goals while reducing fragmentation of care. Supportive oncology patients need pharmacological treatment pathways since cancer patients often suffer from disease and treatment related pain, nausea, and depression [21]. Research suggests that supportive oncology may improve or enhance clinical outcomes for patients with cancer or serious illness by consulting with pharmacotherapies to better control burdensome symptoms and improve quality of life for cancer patients [18, 21, 22].

A critical component of supportive oncology is advance care planning (ACP), which includes discussing and recording patients' preferences for future care. SES is a strong predictor of ACP utilization. Previous epidemiologic studies examined the

influence of sociodemographic and psychosocial factors on advanced care planning and researchers found that patients with higher levels of education and income were more likely to utilize advance care planning compared to their less educated counterparts [18]. Researchers provided evidence that having greater sense of control weakened the adverse relationship between low SES and cancer survival. For example, research suggests that patients with higher levels of education and income were more likely to utilize this resource compared to their less educated counterparts. Researchers provided evidence that having greater sense of control weakened the adverse relationship between low SES and cancer survival [18].

SES and Patterns of Care

Low SEP patients with serious illnesses receive sub-standard supportive and end-of-life care [23]. Research suggests that disproportionate burden of symptoms related suffering, poor health-related communications, and inadequate knowledge of advance care planning promote negative cancer outcomes. Further, increased utilization of hospitals and intensive care units at end-of-life care are more prevalent in lower SES patients [6, 14-17]. Further, researchers noted that the difference in survival for cancer patients from different social groups was unrelated to un-intentional differences in treatment factors related to surgery [6, 14-17, 24]. For example, in previous studies, researchers found that the five-year overall all-cause mortality survival proportion was approximately 78% for African-American women and 89% for white women [4]. Further, black women had significantly higher mortality than white women for both breast cancer-specific death (HR=2.4, confidence interval 1.21 to 4.79) and all-cause mortality HR=1.42 (CI 1.06, 1.89) [25, 26].

Similarly, in a study on multilevel socioeconomic effects on quality-of-life and cancer survival, researchers noted that high SES predicted better cancer survival times [27, 28]. Moreover, researchers provided evidence that the five-year observed lung cancer specific survival rates were 52.7% for whites and 47.5% for blacks with stage one and two disease; 17.7% and 19.6% for blacks and whites respectively at stages three through four [29]. Moreover, researchers aimed to assess racial and SES disparities in a thyroid cancer cohort (n=25,945) using cancer registry data. They found that those who were poor or uninsured had higher odds of presenting with metastatic disease as compared with those with private insurance. Overall survival rates were lower among black patients versus white patients; black patients and those with low SES had worse outcomes for thyroid cancer [30].

Researchers further differentiated between individual and neighborhood levels of socioeconomic status and stratified by race since the measured effects were not the same across all the races [6]. Using cancer registries to identify participants, they conducted interviews to gather socioeconomic information. They measured individual SES by education level and neighborhood SES by education, type of job, geocoded addresses, household income, and position below the poverty line. While education on its own was not associated with breast cancer survival, neighborhood SES (the combined effect of various factors) was associated with cancer survival, albeit to different extents in the various racial groups [6].

An analysis of the Surveillance, Epidemiology and End Results (SEER) data by Kish and colleagues compared the effect of SES between different cancer types in addition to race/ethnicity [1, 8]. This analytic method facilitated the same measurement

of variables across the different cancer types. Results showed that cancer survival improved with higher SES. Further, researchers noted that some high SES Hispanics displayed poorer cancer survival than their white counterparts [6].

SES and Treatment disparities

Similar to comparing the effect of SES among other variables, treatment type should include the effect of race. In a recent study, researchers noted that black males had a lower frequency of any kind of treatment for colorectal cancer than whites at the same stage of disease [31]. Further, researchers found racial disparities an end-of-life care among patients with prostate cancer in a population based study (n=3,789) using SEER Medicare database. The researchers noted differences between the patients who receive chemotherapy based on social gradients [32].

Similarly, researchers found that five-year crude survival was best in highly educated patients compared to the low educated patients for all cancers; compared with low educated, highly educated prostate cancer patients had better survival times [11, 33]. Moreover, researchers found treatment and survival differences in Medicare patients with lung cancer compared to those who are dually eligible for Medicare and Medicaid. The researchers found that dually eligible patients, a low SES proxy, were half as likely to undergo procedures compared to Medicare patients. In fact, they were more likely to receive radiation than Medicare enrollees [34].

Fredrickson and colleagues investigated whether patient characteristics, disease, or treatment explained social inequality in survival from colorectal cancer [35]. They found a positive social gradient in survival for increasing levels of education and income and in homeowners versus renters of housing. They found that differences in survival in

cancer patients from different social groups may have been caused by unintentional differences in treatment factors related to surgery and suggested primary prevention of chronic disease among the socially underserved may reduce social disparities and prognosis [35].

It is well documented that socio-economic status (SES) is a strong predictor of health outcomes [2, 8]. Research suggests that lower SES patients report significant disparities in health and well-being compared to their high SES counterparts [10, 36]. In fact, a complex relationship exists with SES and outcome variables in a variety of clinical populations, albeit the exact nature of the relationship remains unclear [10, 11, 32, 33]. Therefore, we need more research to describe hypothesized relationships in a supportive oncology cohort. We anticipate that such would yield similar findings to those unearthed in other study settings, that is, disparities in outcomes related to socioeconomic positions.

Purpose Statement

The purpose of this study was to examine survival times in a supportive oncology cohort by estimating the relationships between SES and patterns of care. Based on the literature review describing links between socioeconomic status, patterns of care, and cancer outcomes, we proposed the following Research Questions:

Research Question 1.What is the relationship between socio-economic status (SES) and patterns of care among patients in a supportive oncology cohort?

Research Question 2. How might these patterns of care influence survival time for cancer patients?

Chapter II
Title: Socio-economic Status, Patterns of Care, and Survival Times in a Supportive Oncology Cohort

Author: Karen Andrea Armstrong

Abstract

Research suggests that disparities in all-cause cancer survival times include a dynamic interplay of Socio-economic status (SES) and patterns of care. The purpose of this study was to examine survival times and patterns or care among SES strata of a supportive oncology cohort at a large academic medical center. After obtaining IRB approval, a retrospective chart review of medical records from 2013-2017 was conducted. The sample (n=4495) of adult cancer patients was 50% female, almost 50% white, and mostly (81%) high SES position. The mean age was 66.24 years (SD=15.23). Treatment patterns included 13% chemotherapy and 10% radiation, 415 (9%) both chemotherapy and radiation; and 3015 (68%) reported having any treatment. Median survival time was 12.88 days. Over 95% of sample reported multiple comorbidities while 76% reported enrollment in government insurance. Based on the conventional result (OR= 1.64; confidence interval 1.24, 1.99), high SES patients were 1.64 times more likely to have treatment compared to the low SES patients. Conditional on the accuracy of the bias-adjusted model, high SES patients were 4.54 times more likely to receive treatment compared to low SES patients. The hazard of mortality between those with no cancer treatment was HR=1.03 (0.96, 1.11) times the corresponding hazard among those receiving treatment. Our findings, taken in context with those of previous studies, suggest that patients with higher SES are more likely to receive chemotherapy and/or

radiation compared to their low SES counterparts although we did not observe real differences in survival times between treatment groups. We need further investigation to examine the effect of SES in combination with other psychosocial variables to obtain valid estimates of the association between exposure and outcome.

Introduction

Researchers postulated that the dynamic interplay of socioecological and behavioral factors promote negative health outcomes. Additionally, research shows that communities segregated by race or ethnicity experience large differences in social economic status that widen the health disparities chasm. Further, public health implications arise based on one's residence and the context in which races reside; significant racial differences in residential environment persist [6, 14-17].

A plethora of research shows differences and disparities in all cause cancer mortality relating to SES gradient. Empiric evidence shows that marked differences in disease incidence, prevalence, morbidity and mortality persist across race and along socioeconomic gradients [6, 17, 35]. For example, research suggests that education and income partly explained differences in mortality after controlling for age, sex, race, residence, and education. The hazard ratio (HR) for mortality was 3.22 (confidence interval 2.01 to 5.16) for people with low economic status compared to those in high SES group. In fact, even after health risk factors were considered, the risk of dying was still higher for the lowest income group (HR=2.77) compared to the high income group [14].

Similarly, dual medical insurance eligibility was associated with low SES in Medicare patients with lung cancer compared to those who were dually eligible for

Medicare and Medicaid. In fact, patients with low SES were half as likely to undergo a resection and were more likely to receive radiation compared to their high SES counterparts. Further, surgically treated low SEP patients had lower survival times compared to high SEP patients [6, 14, 19, 30, 31, 37-40]. Moreover, household income, education, and private insurance funding increased survival [5]. Patients with lower socioeconomic status versus high SEP were found to present at a higher stage of the disease as well as have a decreased survival [41].

Researchers consistently find that low SES patients had shorter survival times compared to high SES patients. Further, researchers argued that chemotherapy treatment is higher in patients of high SEP compared to those in low SEP regardless of length of survival time and hospice care status [2, 8, 23, 36, 38, 42-47]. While some researchers attempted to differentiate between race and socioeconomic status, they noted that while there was no correlation between race and survival outcomes, high SEP was associated with better cancer survival [19]. Researchers also found racial and social economic disparities in adjuvant chemotherapy for older women with breast cancer using SEERS data and a Medicare database. The researchers noted that adjusted odds of receiving chemotherapy were lower for black women than white women (OR 0.85, confidence interval 0.57- 0.97). Poverty appeared to mediate the association between chemotherapy and race, however no racial or socioeconomic disparities were found among women >70 years old [48].

Methods

Study Design

We conducted a retrospective analysis to evaluate the nature of the relationship between SES and patterns of care in a supportive oncology cohort. After obtaining IRB approval, we conducted a retrospective chart review of supportive oncology patients from 2014-2017 (n=4495) using data restricted to ICD10 codes for solid tumors. Patient variables included patient age, race, sex, medical insurance, primary diagnosis, attending physician specialty, and comorbidity. Primary variables of interest included patient survival times, discharge disposition, demographic variables, and payer insurance information. Cancer treatment includes radiation and chemotherapy. We used zip code median income as a surrogate for individual level SES as well as insurance status including private or government.

Data Analysis

We analyzed data using the Statistical Analysis Software (SAS) application version 9.4. We obtained measures of central tendency and obtained frequency distributions of all variables of interest, cross tabulation of the SES, and mortality contingency tables to investigate the relationship between patterns of care while accounting for association between confounders such as age, gender, race, comorbidities, and insurance status. The dependent variable was survival time (time from admission to event of death or discharge) and the predictors included SES, patterns of care, age, gender, race, and comorbidities. All categorical predictors were dichotomously coded as “0” for low or absent and “1” for high or presence of covariate.

We addressed Research Question 1 by using logistics regression models. We evaluated all predictors graphically and used goodness-of-fit testing to assess whether the proportional odds assumptions were satisfied. Since the Proportional Hazards assumption was not violated for any of the predictors, we utilized Cox Proportional Hazards models to answer Research Question 2.

Bias Analysis

Since we were not able to geocode the addresses and compare to land use maps we may have misclassified SES related to median income for the zip codes documented. We obtained outcome data from medical record review to remove risk of dependent errors, so this will be nondependent misclassification. The exposure misclassification was non-differential given that we documented and assessed the exposure (SES) blinded to the outcome from medical records.

Misclassification of socio-economic status (SES), the dichotomous exposure variable coded as "0" for low SES and "1" for high SES, was the potential bias that threatened validity of the study. The outcome was patterns of care operationally defined as receipt of any cancer treatment (chemotherapy or radiation) coded as "1" and no treatment coded as "0." We conducted a literature review of published studies and external sub study with gold standard measurement for the same population and obtained estimates of sensitivities (0.76) and specificities (0.85) to complete the bias adjustment. We used those values and the observed data to calculate the bias-adjusted association between SES and Treatment. We also varied two of the bias parameters and used a multi-dimensional strategy to recalculate the expected association.

Results

Descriptive statistics are presented in Tables 1-2. Our Research Questions were partially answered. Patients of a high SEP were more likely to receive any cancer treatment (OR= 1.64; confidence interval 1.24, 1.99) compared to their low SEP counterparts. After controlling for age, sex, race, co-morbidities, SES, and insurance status, hazard of mortality between those with no cancer treatment was HR=1.03 (0.96, 1.11) times the corresponding hazard among those receiving treatment. The crude association between patterns of care and SES was 1.64 (CI 1.38, 1.95) compared to the bias adjusted association which ranged from 2.60 to 4.54 (Summary of bias adjusted OR is presented in Table 3).

Discussion

We need further investigation to examine the effect of SES in combination with other psychosocial variables to obtain more valid estimates of the association between exposure and outcome. Socio-economic position (SEP) is a composite measure that typically includes economic status measured by income, social status, education and work status. Although the surrogate SES variables are inter-related, they do not overlap completely.

Researchers often define SES as neighborhood income by zip code and divide into income quintiles to examine the association between SES and cancer outcomes [6]. For example, in one study the association between SES and mortality was most striking in Asian Americans, and not very significant in any of the other racial groups. Although this study did not find any significant effect of education on cancer survival, they showed the interconnected nature of individual and neighborhood level

socioeconomic status and the importance of clarifying their combined effect. Further, they provided evidence that any association between SES and cancer survival may be contingent on a separate measure for each race [6]. In the current study, we used zip code median income as surrogate for SES. However, we were unable to examine SES variables such as education, individual income, and thus we may have missed subtle relationships among SES and other health behaviors and self-management.

Further, SES differences influence rates of mortality and morbidity across clinical populations. Researchers argue that because SES is such a powerful risk factor, researchers often disregard other culprit exposures unless they control for SES. Consequently, researchers regard SES as a control variable and most researchers fail to study it as an important etiologic factor by itself [2, 7].

Strengths and Limitations

Strengths

Our sample size was large and facilitated sophisticated analyses. We used medical record abstraction to obtain four-year follow-up data. We obtained objective values for main predictors.

Bias Analysis

Misclassification of SES was the potential bias that threatened validity of the study. Since we were not able to geocode the addresses and compare to land use maps we may have misclassified SES related to median income for the zip codes documented. We obtained outcome data from medical record review to remove risk of dependent errors, so this will be nondependent misclassification. Based on the conventional result, high SES patients were 1.64 times more likely to have treatment compared to the low SES patients.

Conditional on the accuracy of the bias-adjusted model, high SES patients were 4.54 times more likely to receive treatment compared to low SES patients. The original inference was strengthened since the bias-adjusted result (4.54) was further from the null than conventional estimate (1.64). Thus, I am concerned about bias in the original study. Further research is needed to disentangle complex SES individual variables versus aggregate neighborhood income to derive a more valid and precise estimate of the association between SES and treatment in cancer patients.

Limitations

Our population was a supportive oncology cohort in the Southeast. Study findings may not be generalizeable to other supportive care clinics for cancer patients which are not embedded within an oncology practice. Researchers provide evidence that although supportive care clinics may more effectively address patients and decrease symptom-burden, they may add to fragmentation of care if multiple personnel are involved.

Chapter III
Summary/Implications/Future Directions

Summary

Researchers typically measure SES with a single variable such as income or education. However, although various components of SES correlated, they are not identical. Further, SES functions most powerfully in combinations of psychosocial variables. Researchers posit that many SES variables may dynamically intertwine and standard analytical methods such as linear regression cannot completely analyze these complex relationships [4, 11, 32, 33, 49]. Research suggests that disparities in cancer outcomes may be related to a dynamic interplay of socio-economic position (SEP) and patterns of care. In fact, researchers struggle to find consensus regarding the mechanisms by which SES affects health, because factors associated with low SES are not likely to account for differences in health status at upper levels. However, it is important to identify factors that account for the link to health across all SES strata to elucidate mechanisms previously ignored and misunderstood in the relationship to negative outcomes [14].

Researchers provided evidence that SES affects biological functions, which in turn influence health status. However, we know little about how SES operates to influence biological functions. Lack of consensus may be partially due to how SES is conceptualized and analyzed. For example, researchers operationally define SES as an independent main effect. However, the social environment and associated vulnerability to interpersonal factors, access to social resources and supports, socialization and

socioecological experiences affect health outcomes. Moreover, health behavior domains may also contribute to the SES health gradient.

Public Health Implications

Although one can easily appreciate the effects of low socioeconomic position on survival times, causes and mechanisms of action are not always intuitive. For example, poor nutrition, overcrowding, poor sanitation, and inadequate medical care often underestimate the potent and pervasive effects of SES on health and health outcomes. Researchers suggest that SES and health may be interrelated at every level of the SES hierarchy, not simply below the threshold of poverty, although people with low SES suffer poorer health than those of higher SES [36].

Further, health disparities regarding cancer outcomes including survival times fit into the overall context of public health problems. For example, low SES women often report lower incidence of breast cancer yet they face worse outcomes in survival time. Researchers posit that strong associations among race and patterns of care persist despite significant health improvements in cancer survival over the last few years. In fact, racial/ethnic, health, and socioeconomic disparities persist with African-American and low-income women reporting worse survivals after cancer diagnosis.

Future Directions

We need further research to consider factors that influence SES health gradient including other potential psychosocial variables. Because SES indicators and the cut-points used to categorize levels are not standard, it is not possible to make direct comparisons across studies.

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Appendix A.

Table 1. Descriptive Statistics of Sample Characteristics

Variables Mean (SD)	N (%)
Age (years) 66.24 (SD 15.23)	
Sex (Male)	2259 (50%)
Race (White)	2175 (51%)
Insurance Status	
Government	3363 (77%)
Socio-economic Status	
Low	833 (19%)
Middle	2849 (64%)
High	746 (17%)
Patterns of Care	
Chemotherapy	608 (14%)
Radiation	409 (10%)
Combination Therapy	421 (10%)
No Treatment	3057 (68%)
Survival time (days) 12.88 (SD 15.64)	

Abbreviations: SD (Standard Deviation)

Appendix B.

Table 2. Model Based on Evaluation of SES, Patterns of Care and Survival Times in Supportive Oncology Cohort.

Variables	(n=4495)	Survival Time < 30 days.	HR/OR	95% CI
MAIN EXPOSURES				
Socio-Economic Status (SES)				
Low		770 (92%)		
High		3304 (8%)		
Patterns of Care				
Chemotherapy		536 (13%)		
Radiation		382 (9%)		
*Combination		401 (10%)		
No treatment		2814 (68%)		
High SES and Treatment			OR 1.64	1.24, 1.99
(Bias-Adjusted)			OR 4.54	
Treatment and Survival Time			HR1.03	0.96, 1.11

Footnotes:
* Combination= Chemotherapy and Radiation
Abbreviations: Hazard Ratio (HR)
Odds Ratio (OR)
Confidence Interval (CI)

Appendix C.

Table 3. Bias-Adjusted Table for Association Between Socio-economic Status (SES) and Treatment.

	Bias-Adjusted		
Socio-economic Status (SES)	Low SES	High SES	Total
Treatment	1335.6	1679.4	3015
No Treatment	210.6	1202.4	1413

Bias-adjusted Odds Ratio = 4.54

Appendix D.

Table 4. Socio-economic Status (SES) Stratified by Race

	N (%)			
Socio-economic Status (SES)	**Low**	**Middle**	**High**	**Total**
Non-white	711 (34.3%)	1185 (57.2%)	177 (8.5%)	2073 (49.2%)
White	101 (4.7%)	1502 (70.2%)	538 (25.1%)	2141 (50.8%)

Missing=281

Appendix E.

Table 5. Survival Time (days) Stratified on Treatment Status.

	N (%)		
Survival Time	**< 30 days**	**≥ 30 days**	**Total**
No treatment	2814 (68%)	243 (67%)	3057 (68%)
Any treatment	1319 (32%)	119 (33%)	1438 (32%%
Total	4133 (92%)	362 (8%)	4495